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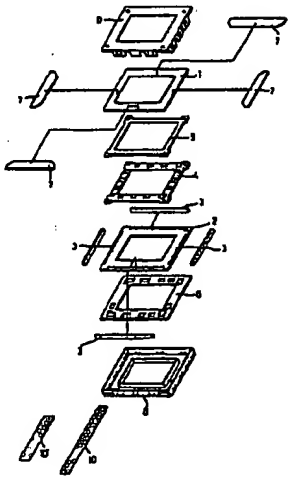
(54) [Title of the Device] LIQUID CRYSTAL DISPLAY DEVICE

(57) [Abstract]

[Object] [The object of the present device is] to reduce the external dimensions of the frames [in a liquid crystal display device].

[Constitution] In a liquid crystal display device in which a liquid crystal display panel 1 having a display region that substantially coincides with the display windows of frame-form frames 8 and 9 in which such display windows are formed, a circuit board 2 on which a driving circuit that drives the above-mentioned display panel 1 is formed, and which has a shape that substantially coincides with [the shape of] the above-mentioned frames 8 and 9, and connecting means 3 for electrically connecting the above-mentioned board and the above-mentioned display panel, are accommodated inside the space formed between the above-mentioned frames 8 and 9, the external dimensions of the circuit board are reduced by forming driving circuits on both surfaces of the above-mentioned board 2, and overlapping the above-mentioned display panel 1 and the above-mentioned circuit board 2 until the outer peripheral part of this display panel 1 overlaps with at least the driving circuit formed on one surface of the above-mentioned board 2, so that the external dimensions of the frames are reduced as a result.



[Claims]

[Claim 1] A liquid crystal display device which is characterized by the fact that in a liquid crystal display device in which a liquid crystal display panel having a display region that substantially coincides with the display windows of frame-form frames [*sic*][1] in which such display windows are formed, a circuit board on which a driving circuit that drives this liquid crystal display panel is formed, and which has a shape that substantially coincides with [the shape of] the above-mentioned frame-form frames, and connecting means for electrically connecting the above-mentioned circuit board and the above-mentioned liquid crystal display panel, are accommodated inside the space formed between the above-mentioned frames, driving circuits are formed on both surfaces of the above-mentioned circuit board, and the outer peripheral part of the above-mentioned liquid crystal display panel is overlapped with at least the driving circuit formed on one surface of the above-mentioned circuit board.

[Brief Description of the Drawings]

[Figure 1] Figure 1 is an exploded perspective view of one embodiment of the liquid crystal display device of the present device.

[Figure 2] Figure 2 is a sectional view of the device of the present device.

[Figure 3] Figure 3 is a diagram which shows constituent parts of the device of the present device.

[Figure 4] Figure 4 is a diagram which shows constituent parts of the device of the present device.

[Figure 5] Figure 5 is a diagram which shows constituent parts of the device of the present device.

[Figure 6] Figure 6 is a diagram which shows constituent parts of the device of the present device.

[Figure 7] Figure 7 is a diagram which shows constituent parts of the device of the present device.

[Figure 8] Figure 8 is a diagram which shows constituent parts of the device of the present device.

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[1] Translator's note: This is a literal translation of the Japanese phrase; the first "frame" as in "frame-form" is the translation of the Japanese native term, and the second "frame" is a representation of the English word "frame" that is transliterated in the Japanese. This phrase occurs repeatedly in the text, and is given in the translation as is.

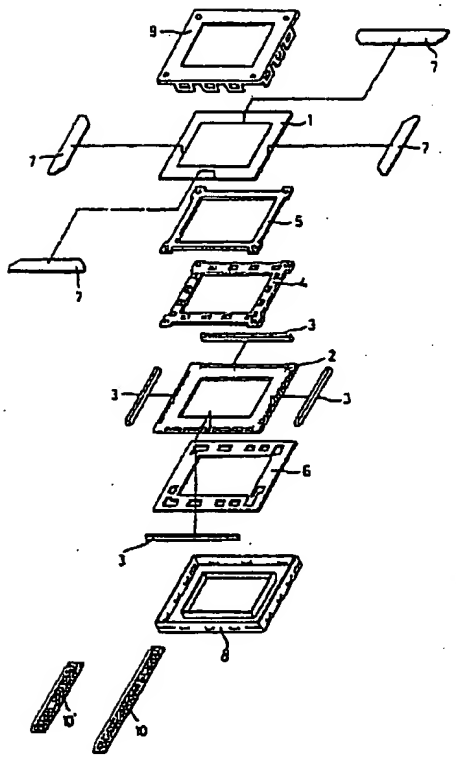
[Figure 9] Figure 9 is a diagram which shows constituent parts of the device of the present device.

[Figure 10] Figure 10 is a diagram which shows constituent parts of the device of the present device.

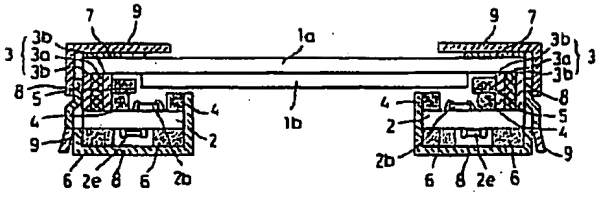
[Figure 11] Figure 11 is a diagram which shows constituent parts of the device of the present device.

[Explanation of Symbols]

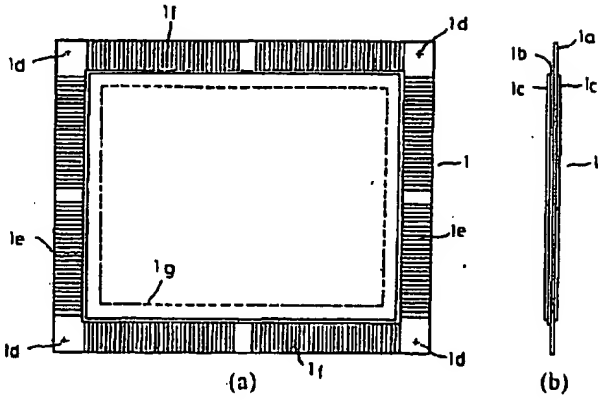
1: Liquid crystal display panel
2: Circuit board
3: Zebra rubbers
4: Molding plate
5: Molding plate
6: Spacer
7: Cushioning members
8: Metal frame
9: Metal frame
10: Flexible flat lead wire
10': Flexible flat lead wire



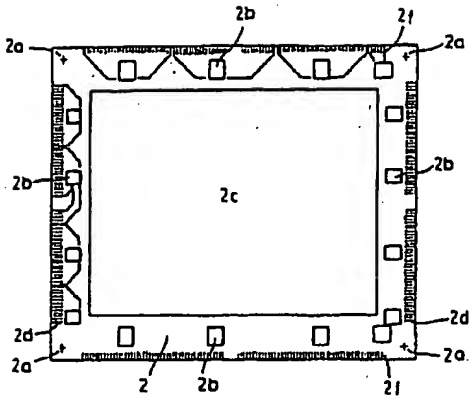
[Figure 1]



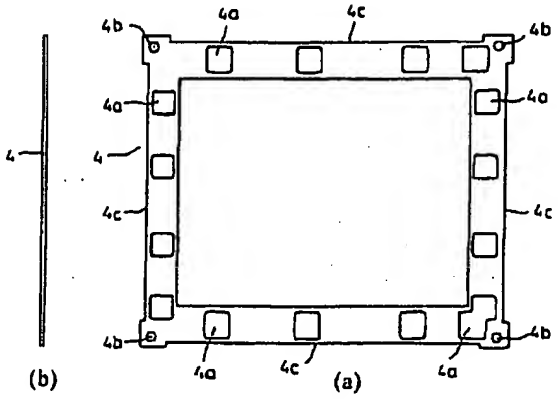
[Figure 2]



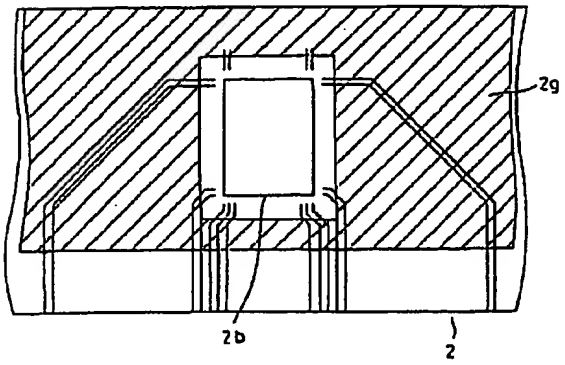
[Figure 3]



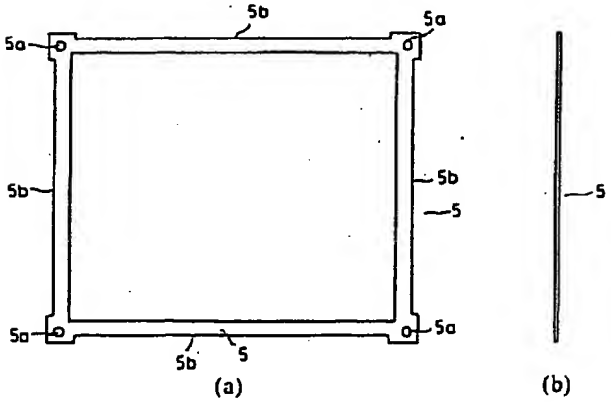
[Figure 4]



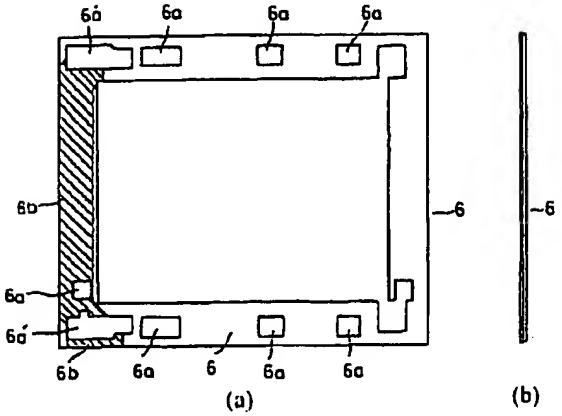
[Figure 5]



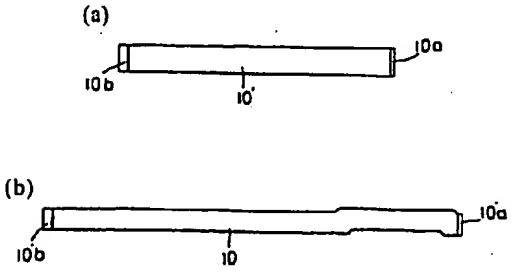
[Figure 6]



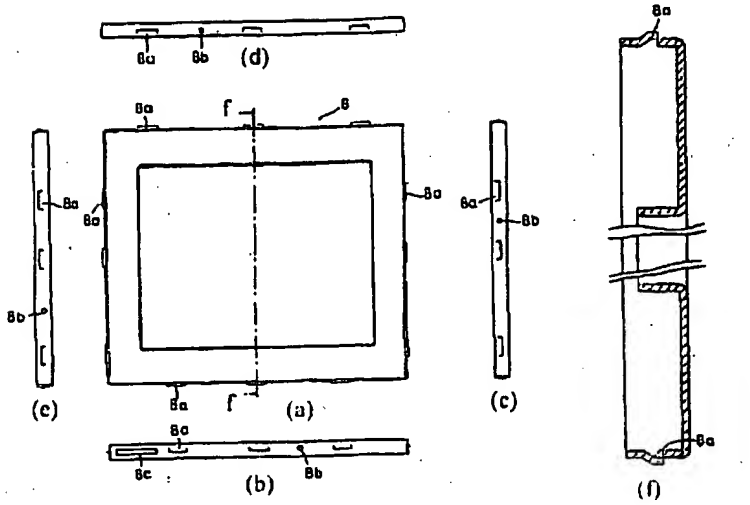
[Figure 7]



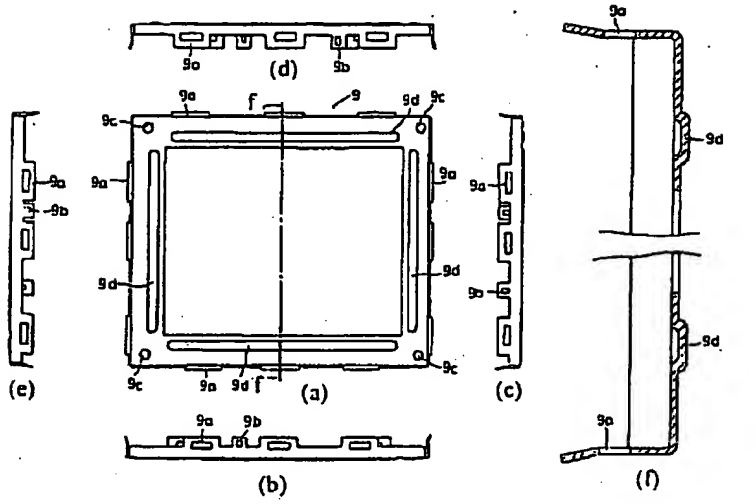
[Figure 8]



[Figure 9]



[Figure 10]



[Figure 11]

[Detailed Description of the Device]

[0001]

[Field of Industrial Utilization]

The present device relates to a liquid crystal display device, and more particularly relates to a liquid crystal display device in which the liquid crystal display panel and the driving circuit that is used to drive the display of this panel are modulized.

[0002]

[Prior Art]

In recent years, as has been disclosed in an article titled "*Bunsho to gazo hyoji wo nerau furatto paneru deisupurei*" ["Flat panel displays aimed at the display of documents and images"] in the January 2, 1984 issue of Nikkei Electronics, the development of various types of display devices such as systems using liquid crystal display devices, systems using electroluminescent display devices and systems using plasma displays has been pursued as devices that replace CRT display devices, and the future prospects of liquid crystal display devices in terms of allowing reduced power consumption and increased volume are currently highly evaluated.

[0003]

As a result of the use of such liquid crystal display devices, it has been possible to realize compact 3-inch or 5-inch television receivers that are small enough to be called "pocket televisions." However, the liquid crystal display devices of currently existing pocket television receivers are almost all devices of the type in which a liquid crystal display panel and a driving circuit board that is used to cause the display performed by this panel are separately mounted inside the receiver and connected by flexible lead wires. In such cases, the work of assembling the liquid crystal display device including the work of connecting the flexible lead wires, etc., is complicated. Furthermore, since the driving circuit board is disposed on the outside of the liquid crystal display panel, there are limits to how far the size of the television receiver itself can be reduced, as a result of the presence of dead space for the assembly of such parts.

[0004]

[Problems that the Device is to Solve]

The present device was devised in light of the above-mentioned points; [the object of the present device] is to reduce the area of the circuit board by forming driving circuits on both

surfaces of the circuit board, and to reduce the external dimensions of this circuit board by overlapping the liquid crystal display panel and the circuit board to the point where the outer peripheral part of this panel overlaps with at least the driving circuit formed on one surface of this board, so that the external dimensions of the frame are reduced.

[0005]

[Means for Solving the Problems]

The liquid crystal display device of the present device is [characterized by the fact that] in a liquid crystal display device in which a liquid crystal display panel having a display region that substantially coincides with the display windows of frame-form frames in which such display windows are formed, a circuit board on which a driving circuit that drives this liquid crystal display panel is formed, and which has a shape that substantially coincides with [the shape of] the above-mentioned frame-form frames, and connecting means for electrically connecting the above-mentioned circuit board and the above-mentioned liquid crystal display panel, are accommodated inside the space formed between the above-mentioned frames, driving circuits are formed on both surfaces of the above-mentioned circuit board, and the outer peripheral part of the above-mentioned liquid crystal display panel is overlapped with the driving circuits on the above-mentioned circuit board [*sic*][2].

[0006]

[Operation]

In the liquid crystal display device of the present device, a liquid crystal display panel which has a display region that substantially coincides with the display windows of frame-form frames in which such display windows are formed, a circuit board on which a driving circuit that drives this liquid crystal display panel is formed, and which has a shape that substantially coincides with [the shape of] the above-mentioned frame-form frames, and connecting means for electrically connecting the above-mentioned circuit board and the above-mentioned liquid crystal display panel, are accommodated inside the space formed between the above-mentioned frames, driving circuits are formed on both surfaces of the above-mentioned circuit board, and the above-mentioned liquid crystal display panel and circuit board are overlapped to a point where the outer peripheral part of this liquid crystal display panel is overlapped with the driving circuits on the above-mentioned circuit board [*sic*]. Consequently, the external dimensions of the above-

[2] Translator's note: here and in the following paragraph, the phrase "at least ... on one surface of," which is present in the Abstract, Claims, and Effect of the Device sections, seems to be inadvertently omitted in the original.

mentioned circuit board are reduced, and as a result, the external dimensions of the frames are reduced.

[0007]

[Embodiments]

An exploded perspective view of one embodiment of the liquid crystal display device of the present device is shown in Figure 1, a sectional view of this liquid crystal display device is shown in Figure 2, and essential parts of this liquid crystal display device are shown in Figures 3 through 11.

[0008]

As is shown in Figures 1 and 2, the liquid crystal display device of the present embodiment comprises a liquid crystal display device panel 1 which performs a light transmission-type pixel display by performing a shutter action in pixel units with respect to natural light or light from back-lighting, a circuit board 2 on which driving circuits used to drive this liquid crystal display device panel 1 are formed, and zebra rubbers 3 ... that electrically connect the above-mentioned panel 1 and circuit board 2, and these parts are modulized by being integrally accommodated inside frame-form metal frames 8 and 9 with a two-plate (front and back) construction in which display windows are formed.

[0009]

The respective constituent parts will be described in detail below.

In the liquid crystal display panel 1, as is shown in the plan view shown in Figure 3 (a) and the side view shown in Figure 3 (b), a liquid crystal substance is interposed between two glass substrates 1a and 1b on which electrodes are formed, and polarizing plates 1c, 1c are respectively pasted to the outside surfaces of these two glass substrates 1a and 1b. An active matrix type panel in which TFTs are connected to the respective pixel electrodes as disclosed in Japanese Patent Application Kokai No. S58-25689 is used as the above-mentioned liquid crystal display panel 1. While the panel dimensions are 105 mm × 127 mm, a central portion with dimensions of 76 mm × 100 mm constitutes the image display region (indicated by broken lines in the figures). Furthermore, of the two substrates 1a and 1b, the terminal-equipped substrate 1a on which the TFTs are disposed has a larger area than the other substrate 1b. Specifically, timing signal input terminals (on the left and right sides) 1e, 1e used for on-off control of the TFTs, and video signal input terminals (on the upper and lower sides) 1f, 1f, are formed on the peripheral

parts of the terminal-equipped substrate 1a, which extend beyond the peripheral parts of the other substrate 1b.

[0010]

Accordingly, since the external dimensions of the modulized liquid crystal display panel 1 are determined by the terminal-equipped substrate 1a, cruciform point marks 1d ... used for positioning are formed on the respective corner locations of the terminal-equipped substrate 1a.

[0011]

As is shown in Figure 4, the circuit board 2 comprises a printed board that carries and wires the circuit elements. This circuit board has the shape of a frame with external dimensions that are substantially equal to those of the above-mentioned liquid crystal display panel 1. A rectangular window 2c located in the center of the circuit board 2 is set so that this window matches the size of the effective image display region 1g in the central portion of the liquid crystal display panel 1 or is broader than this effective image display region 1g. Examples of the circuit elements of such a board 2 include ICs 2b ... used to create timing signals or video signals that drive the liquid crystal display panel 1, and other chip parts 2e ... such as resistors. For example, 15 ICs 2b ... are mounted on the side of the front surface (i.e., the surface that faces the liquid crystal display panel 1) of this board 2, and (for example) 9 chip parts 2e ... are mounted on the side of the back surface. Furthermore, timing signal output terminals (left and right sides) 2d, 2d and video signal output terminals (upper and lower sides) 2f, 2f are provided on the outer peripheral parts of this board 2 in correspondence with the respective terminals of the above-mentioned liquid crystal display panel 1. Moreover, terminals into which R, G and B image signals and IC control signals, etc., are input are disposed in two places on the back surface side of this board 2, separated into two flexible flat lead wires 10, 10'.

[0012]

Electrical connections between the above-mentioned circuit board 2 and liquid crystal display panel 1 are accomplished by means of zebra rubbers 3 ... that are interposed in a compressed state between the terminals of the respective parts. In this case, the corresponding terminals of both parts must accurately face each other above and below. Accordingly, point marks 2a are also formed on the respective corners of the above-mentioned circuit board 2 in the same manner as in the above-mentioned liquid crystal display panel 1, and the corresponding terminals of the circuit board 2 and liquid crystal display panel 1 are caused to correspond to each other above and below by the positioning of these marks 1d ... and 2a ..., so that accurate connections can be made by means of the zebra rubbers 3 ... . Furthermore, these zebra rubbers

3 have a sandwich structure in which an anisotropic conductive part 3a is sandwiched between two insulating parts 3b, 3b, and good electrical connections are obtained by maintaining these zebra rubbers 3 at an appropriate compression rate (about 15%). For example, the "SR connector" (commercial name) manufactured by Shin-Etsu Polymer Co., Ltd., can be used as such zebra rubbers 3.

[0013]

A combination of the above-mentioned liquid crystal display panel 1, circuit board 2 and zebra rubbers 3 is basically accommodated inside the metal frames 8 and 9; here, frame-form molding plates 4 and 5 and a spacer 6 that are used to protect the ICs 2b ... and chip products 2e ... that are mounted on the front and back surfaces are joined to the above-mentioned circuit board 2 by means of a bonding agent or two-sided [adhesive] tape.

[0014]

As is shown in the plan view shown in Figure 5 (a) and side view shown in Figure 5 (b), the first molding plate 4 has the shape of a frame that substantially coincides with that of the circuit board 2, and relief holes 4a ... that are used for resin potting are formed [in this molding plate 4] in places corresponding to the ICs 2b ... on the front surface of the circuit board 2. Specifically, frames for resin potting are not provided separately for each of the respective ICs 2b ... that are joined to the circuit board 2 by die bonding or wire bonding, etc.; instead, resin potting frames for all of the ICs 2b ... are formed at one time by means of the relief holes 4a ... in this first molding plate 4. Accordingly, resin molding of the ICs 2b ... can be accomplished by performing resin potting (resin dropping) on top of the ICs 2b ... that are exposed from the relief holes 4a ..., and allowing this resin to solidify naturally. Here, however, in cases where there is a gap between the circuit board 2 and the first molding plate 4, there is a danger that accidents may occur in which the potting resin flows out from this gap during potting and insulates the terminals 2d, 2d and 2f, 2f. Consequently, it is necessary to ensure that no steps are formed particularly in the areas surrounding the ICs 2b ... on the circuit board 2. Accordingly, in the circuit board 2 of the present embodiment, as is shown in Figure 6, a solder resist 2g (indicated by hatching) which is a surface insulating film on the printed board (on which metal wiring patterns are formed) constituting the circuit board 2 is applied as a coating so that this solder resist 2g surrounds the electrode parts of the ICs (2b), thus flattening the areas surrounding the ICs 2b ... so that such steps are eliminated. Thus, since there is no gap between the circuit board 2 and the first molding plate 4 in the areas surrounding the ICs 2b ..., there is no need to coat the entire joining surfaces of these two parts 2 and 4 with a bonding agent; the two parts 2 and 4 may be bonded by means of a bonding agent that is applied in only a few places.

[0015]

As was described above, the first molding plate 4 serves for the molding of the ICs 2b ...; in addition, cut-out parts 4c ... and 5b ... are formed in the four outside sides of both [this first molding plate 4] and the second molding plate 5 (shown in the plan view shown in Figure 7 (a) and the side view shown in Figure 7 (b)) that is joined to this first molding plate 4, and the zebra rubbers 3 ... are inserted into these cut-out parts 4c ... and 5b ..., so that these rubbers 3 ... are positioned. Furthermore, since the first and second molding plates 4 and 5 are present between the liquid crystal display panel 1 and circuit board 2, through-holes 4b ... and 5a ... are formed in the respective corners of the first and second molding plates 4 and 5 so that the first and second point marks 1d ... and 2a ... used for positioning can be seen. Furthermore, cut-outs may be formed instead of these through-holes 4b ... and 5a .... The outside dimensions of these first and second frame-form molding plates 4 and 5 substantially coincide; in regard to the inside dimensions, however, the dimensions of the second molding plate 5 are greater than those of the first molding plate 4. Meanwhile, the inside dimensions (opening dimensions) of the second molding plate 5 are greater than the outside dimensions of the lower glass substrate 1b of the liquid crystal display panel 1 that is adjacent to this second molding plate 5, so that contact between these parts is prevented. For example, the material of these first and second molding plates 4 and 5 is an insulating material such as an epoxy resin or silicone resin; moreover, these parts can be integrally molded.

[0016]

In the spacer 6, as is shown in the plan view shown in Figure 8 (a) and side view shown in Figure 8 (b), relief holes 6a ... used to protect the chip parts 2e ... are formed in places corresponding to the respective chip parts 2e ... [that are mounted] on the back surface of the circuit board 2. The material of this spacer 6 may be the same as that of the above-mentioned molding plates 4 and 5. Furthermore, in this spacer 6, relief holes 6a' and 6a" for the soldering parts of the input terminals of the two flexible flat lead wires disposed in two places on the back surface side of the circuit board 2, and recessed grooves 6b which have the minimum depth required to allow relief of the thickness of the two flexible flat lead wires 10 and 10' (shown in the plan views in Figures 9 (a) and 9 (b)) that are respectively led out in the same direction (downward in the figures) from the soldering parts in these holes 6a' and 6a", are formed in a pattern indicated by hatching in Figure 8 in the surface that faces the circuit board 2. Specifically, the longer lead wire 10 is led out downward through the recessed groove 6b from the position of the upper hole 6a', and is overlapped and joined with the shorter lead wire 10' that is led out further downward from the position of the lower hole 6a". Furthermore, soldering

parts 10a, 10b, 10a' and 10b' are disposed on both end parts of the respective lead wires 10 and 10'. Accordingly, no gap caused by the presence of this lead wire 10 [*sic*][3] is generated between the circuit board 2 and spacer 6. This is important for preventing compressive strain with respect to the above-mentioned zebra rubbers 3, and makes it possible to avoid faulty electrical continuity of the zebra rubbers 3.

[0017]

The above-mentioned liquid crystal display panel 1, the circuit board 2 to which the molding plates 4 and 5 and spacer 6 are joined, and the zebra rubbers 3 ... positioned between these two parts 1 and 2, are elastically clamped by the frame-form back-side metal frame 8 formed by the press molding of an iron plate as shown in Figure 10, and the frame-form front-side metal frame 9 formed by the press molding of an iron plate as shown in Figure 11. Furthermore, in both Figures 10 and 11, (a) shows a plan view, (b) through (c) [*sic*][4] show respective side views, and (f) shows an enlarged sectional view. Specifically, elastic anchoring parts 8a ... on the peripheral outer wall part of the back-side metal frame 8 are engaged with anchoring holes 9a formed in the locations of tongue parts on the peripheral outer wall part of the front-side metal frame 9; as a result, the zebra rubbers 3 ... are appropriately compressed between the two joined frames 8 and 9. Accordingly, peripheral locations on the front surface of the liquid crystal display panel 1 are press-bonded to the inside surface of the front-surface metal frame 9. In the present embodiment, therefore, four rectangular cushioning members 7 consisting of Teflon are interposed between the parts 1 and 9 in order to prevent cracking of the glass substrate 1a of the above-mentioned panel 1. Furthermore, these cushioning members 7 can also be integrally formed and used as [a single] frame-form part; in any case, however, it is necessary to exclude the locations of the point marks 1d ... of the liquid crystal display panel 1 at the respective corners. In this regard, window holes 9c ... are formed in the respective corners of the front-side metal frame 9 so that the respective point marks 1d ... and 2d ... [*sic*][5] of the above-mentioned liquid crystal display panel 1 and circuit board 2 can be seen.

[0018]

Furthermore, screw holes 8b ... and 9b ... used for the final screw fastening of the two metal frames 8 and 9 are formed in the respective peripheral wall parts of the two metal frames 8 and 9. Moreover, a slit 8c through which the flexible flat lead wires 10 and 10' are both led out to the

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[3] Translator's note: Here, the phrase "these lead wires 10 and 10'" is probably intended instead of "this lead wire 10."

[4] Translator's note: apparent error in the original for "(b) through (e)."

[5] Translator's note: apparent error in the original for "2a."

outside in a state in which the two lead wires are superimposed is formed in the peripheral wall part of the back-side metal frame 8.

[0019]

Next, the assembly of the respective constituent parts described above will be briefly described.

First, the circuit board 2 to which the spacer 6 and molding plates 4 and 5 have been joined is placed inside the back-side metal frame 8 which is fastened to a jig. At this time, the flexible flat lead wires 10 and 10' are led out to the outside via the slit 8c.

In this state, the terminals 2b, 2b and 2f, 2f that are exposed from the cut-outs 4c ... and 5b ... in the molding plates 4 and 5 are surrounded by these molding plates 4 and 5 and the peripheral wall parts of the back-side metal frame 8, and the zebra rubbers 3 ... are respectively inserted into these positions. Specifically, these molding plates 4 and 5 and the back-side metal frame 8 are used as members that regulate the positions of the zebra rubbers.

[0020]

Subsequently, the terminals 1e, 1e and 1f, 1f of the liquid crystal display panel 1 are placed on top of the four zebra rubbers 3 .... At this time, the point marks 1d ... on the four corners of the liquid crystal display panel 1 are accurately aligned with the point marks 2a ... on the four corners of the circuit board 2. Then, in this state, the front-surface metal frame 9 is placed [on top] with the above-mentioned cushioning members 7 ... interposed, and is press-bonded downward, so that the two frames 8 and 9 are elastically joined. Finally, if the alignment of the above-mentioned point marks 1d ... and 2a ... which can be seen via the window holes 9c ... in the four corners of the front-surface metal frame 9 is reconfirmed, the two metal frames 8 and 9 are screw-fastened via the screw holes 8b ... and 9b .... As a result, a modulized liquid crystal display device is completed.

[0021]

In such a module, since the respective plate-form constituent parts are press-bonded inside the frames 8 and 9 by the elastic force of the zebra rubbers 3 ... as described above, compressive strain may be generated in the zebra rubbers 3 ... in a compressed state, so that the problem of faulty electrical continuity between the liquid crystal display panel 1 and circuit board 2 arises if there are gaps or steps between these respective constituent parts; however, this problem is eliminated in the device of the present embodiment. Specifically, even if flexible flat lead wires are partially interposed, gaps and steps are eliminated as a result of the formation of recessed

grooves used for relief in the spacer 6 as described above, so that the compressed state of the zebra rubbers 3 ... is made uniform.

[0022]

[Effect of the Device]

As a result of the formation of driving circuits on both surfaces of the circuit board, the area of the circuit board is reduced. Furthermore, the external dimensions of the circuit board are reduced by overlapping the liquid crystal display panel and circuit board to a point where the outer peripheral part of this panel overlaps with at least the driving circuit formed on one surface of the above-mentioned board. Accordingly, the external dimensions of the frames can be reduced.

(19)

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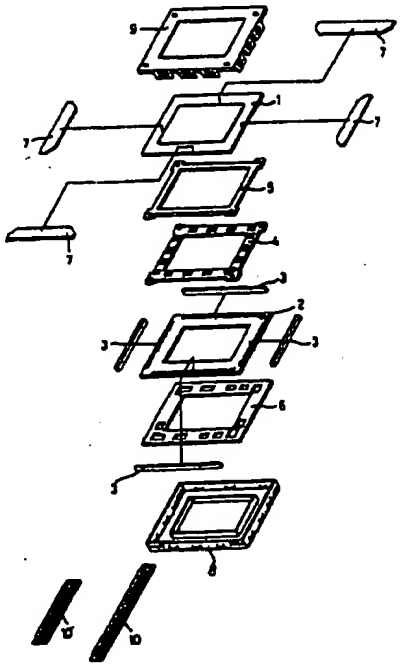
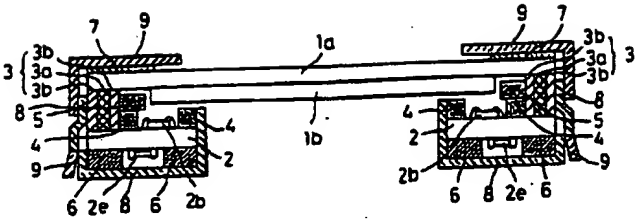
(54)【考案の名称】　液晶表示装置

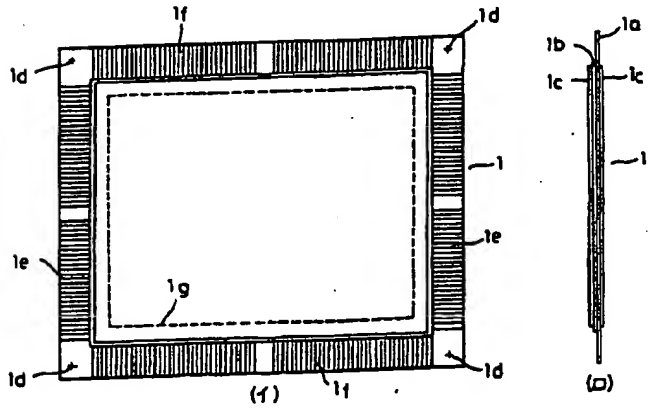
(57)【要約】
【目的】　フレームの外形寸法を小さくすること。
【構成】　表示窓を設けた枠状のフレーム８、９の空間内に、該フレームの表示窓にほぼ合致する表示領域を有する液晶表示パネル１と、該表示パネル１を駆動する駆動回路が形成されかつ上記フレーム８、９にほぼ合致する形状の回路基板２と、該基板と上記表示パネルとの電気的接続を行なう接続手段３とを収納してなる液晶表示装置に於いて、上記基板２の両面に駆動回路を形成し、かつ上記表示パネル１の外周部が上記回路基板２の少なくとも片面に形成された駆動回路と重畳する状態にまで、このパネル１と基板２とを重畳させることにより、回路基板の外形寸法が小さくなり、その結果、フレームの外形寸法が小さくなる。



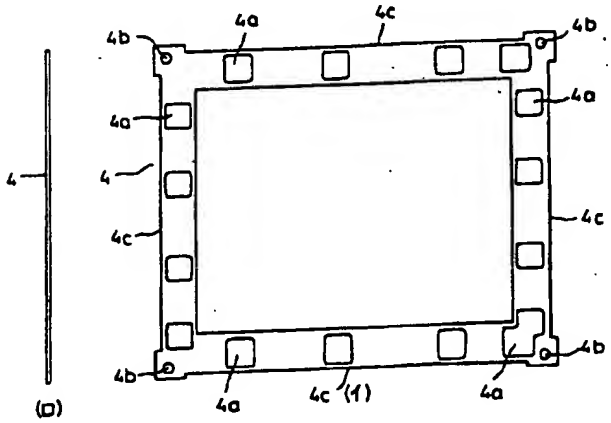
【図2】


7
9
1a
3b
3a
3b
3
8
5
4
2
9
6
2e
8
6
2b
1b
9
7
3b
3a
3b
3
8
5
4
2
9
2b
6
8
2e
6

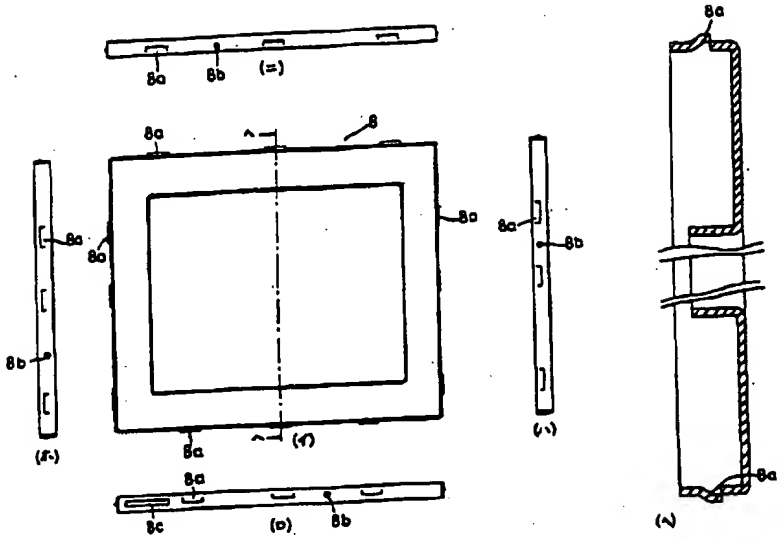
【図3】


1f
1d
1d
1
1e
1e
1g
1d
1d
(イ)
1f
1a
1b
1c
1c
1
(ロ)

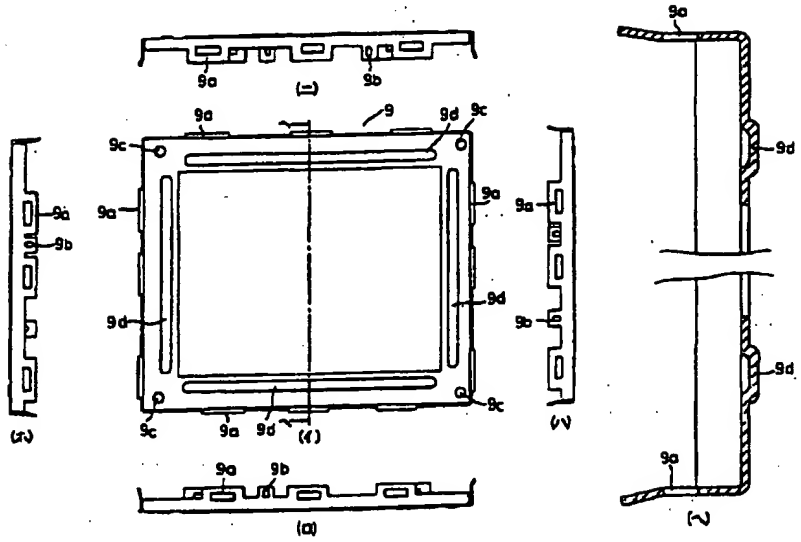
【図5】


4
(ロ)
4b
4a
4c
4b
4a
4
4c
4b
4a
4c
(イ)
4a
4b
4a
4b

【図10】



【図11】



が流出して端子2d、2d、2f、2fを絶縁してしまう事故の惧れがあるので、特に回路基板2のＩＣ2b…周囲箇所に段差が生じないようにする必要がある。従って、本実施例の回路基板2では図6に示す如く、回路基板2をなす金属配線パターンが形成されたプリント基板の表面絶縁膜であるソルダーレジスト2g（ハッチングで示す）をＩＣ(2b)用電極部を取り囲むように塗布する事によって、ＩＣ2b…周囲箇所を平坦として、その段差を解消している。このように、ＩＣ2b…周囲箇所に於いて、回路基板2と第1のモールド板4との間にすき間が皆無となるので、これ等両者2、4の接合面全面に接着剤を塗布することなく数箇所のみの接着剤によって両者2、4を接着してもよい。

【0015】

上述の如く第1のモールド板4はＩＣ2b…のモールドの為に作用する他、この第1のモールド板4に接合される図7の（イ）の平面図及び同図（ロ）の側面図に示す如き第2のモールド板5と共にその4外側辺に切欠部4c…、5b…が設けられ、この切欠部4c…、5b…にゼブラゴム3…が入り込みこのゴム3…の位置決めが行われるのである。又、第1及び第2のモールド板4、5は、液晶表示パネル1と回路基板2との間に存在するので、これ等1、2の位置合せの為のポイントマーク1d…、2a…が目視できるように、第1及び第2のモールド板4、5の各コーナーに貫通孔4b…、5a…が形成されている。尚、この貫通孔4b…、5a…に代えて切欠を形成してもよい。これ等枠状の第1及び第2のモールド板4、5はその外側寸法はほぼ一致するが、その内側寸法は第2のモールド板5の方が第1のそれ4より大きい。一方、第2のモールド板5の内側寸法（開口寸法）はこれに近接する液晶表示パネル1の下方のガラス基板1bの外側寸法より大きく、これ等が接触するのを防止している。これ等第1及び第2のモールド板4、5は例えばエポキシ樹脂やシリコン樹脂等の絶縁材料、またこれ等を一体成形する事も可能である。

【0016】

スペーサー6は図8（イ）の平面図及び同図（ロ）の側面図に示す如く、回路基板2裏面の各チップ部分2e…に対応する箇所にチップ部分2e…保護用の逃し穴6a…が形成されている。このスペーサー6の材質は上記モールド板4、5と同じ

【0005】

【課題を解決するための手段】

本考案の液晶表示装置は、表示窓を設けた枠状のフレームの空間内に該フレームの表示窓にほぼ合致する表示領域を有する液晶表示パネルと、該液晶表示パネルを駆動する駆動回路が形成されかつ上記枠状フレームとほぼ合致する形状の回路基板と、該回路基板と上記液晶表示パネルとの電気的接続を行なう接続手段とを収納してなる液晶表示装置に於いて、上記回路基板は両面に駆動回路が形成されてなり、上記液晶表示パネルの外周部が上記回路基板の駆動回路と重畳したものである。

【0006】

【作用】

本考案の液晶表示装置によれば、表示窓を設けた枠状のフレームの空間内に該フレームの表示窓にほぼ合致する表示領域を有する液晶表示パネルと、該液晶表示パネルを駆動する駆動回路が形成されかつ上記枠状フレームとほぼ合致する形状の回路基板と、該回路基板と上記液晶表示パネルとの電気的接続を行なう接続手段とを収納し、上記回路基板の両面に駆動回路を形成すると共に、上記液晶表示パネルの外周部が上記回路基板の駆動回路と重畳する状態にまで、この液晶表示パネルと回路基板を重畳させることにより、前記回路基板の外形寸法が縮小され、その結果、フレームの外形寸法が小さくなる。

【0007】

【実施例】

本考案の液晶表示装置の一実施例の分解斜視図を図１に、その断面図を図２に示し、さらにその要部を図３乃至図１１に示す。

【0008】

図１及び図２に示す如く、本実施例の液晶表示装置は自然光あるいはバックライトからの光に対して画素単位でシャッター作用をなして光透過型の画素表示を行なう液晶表示装置パネル１と、これを駆動する為の駆動回路を形成した回路基板２と、これ等パネル１と回路基板２との電気的接続を行なうゼブラゴム３……と、からなり、これ等を表示窓を設けた枠状の表裏２枚構成の金属フレーム８，

9内に一体的に収納してモジュール化したものである。

【0009】

以下に各構成部分について詳述する。

液晶表示パネル1は図3（イ）の平面図及び同面（ロ）の側面図に示す如く、電極が設けられた2枚のガラス基板1a、1b間に液晶物質が介在しており、この2枚のガラス基板1a、1bの外側面には夫々偏光板1c、1cが貼着されている。この液晶表示パネル1としては特開昭58-25689号公報に開示の如き各画素電極にＴＦＴを結合したアクティブマトリクス型が採用され、パネル寸法105mm × 127mmに対して中央部の寸法 76mm × 100mmが画像表示領域（図中破線で示す）となっている。尚両基板1a、1bの内ＴＦＴを設けた方の端子付基板1aが他方の基板1bより大面積となっている。即ち、他方の基板1bの外周部からさらに延長している端子付基板1aの周辺部にはＴＦＴのon、off 制御の為タイミング信号入力用端子（左右側辺）1e、1eと映像信号入力端子（上下側辺）1f、1fとが形成されている。

【0010】

従って、モジュール化される液晶表示パネル1の外形寸法は、端子付基板1aによって決まるので、端子付基板1aの各コーナー箇所に位置合わせ用の十字印のポイントマーク1d…が形成されている。

【0011】

回路基板2は図4に示す如く、回路要素を載置配線するプリント基板からなり、上記液晶表示パネル1と外形寸法がほぼ等しい枠状をなし、その中央の長方形の窓2cは液晶表示パネル1の中央部の有効な画像表示領域1gと合致するか、あるいはそれよりも広くなるように設定されている。斯る基板2の回路要素としては、液晶表示パネル1を駆動するタイミング信号あるいは映像信号を作る為のＩＣ 2b …とその他抵抗等のチップ部分 2e …とがあり、この基板2の表面（液晶表示パネル1と対向する面）側に例えば１５個のＩＣ 2b …が載置され、その裏面側に例えば9個のチップ部分 2e …が載置される。そして、この基板2の周辺部には、上記液晶表示パネル1の各端子と対応して、タイミング信号出力端子（左右側辺）2d、2dと映像信号出力端子（上下側辺）2f、2fとが設けられている。さらには、この基板2の裏面側には2枚のフレキシブルフラットリード線 10 、10

であってよい。そしてさらに、このスペーサー6には回路基板2の裏面側2箇所に設けた2枚のフレキシブルフラットリード線用入力端子の半田付け部に対する逃し穴6a'、6a''と、この穴6a'、6a''の半田付け部から夫々同一方向（図中の下方）に引き出される図9（イ）（ロ）の平面図に示す如き2枚のフレキシブルフラットリード線10、10'の厚みを逃す為の必要最小限の深さをもつ凹溝6bが回路基板2に対向する面に図8にハッチングで示す如きパターンで形成されている。即ち、長い方のリード線10が上方の穴6a'位置から凹溝6b内を下方に引き出され、下方の穴6a''位置からさらに下方に引き出される短い方のリード線10'と重ね合わせられている。尚、各リード線10、10'の両端部には半田付け部10a、10b、10a'、10b'が設けられている。従って、回路基板2とのスペーサー6との間にこのリード線10の存在によるすき間が生じることはない。この事は上述のゼブラゴム3に対する圧縮歪を防止する意味で重要であり、ゼブラゴム3の導通不良を回避している。

【0017】

以上の液晶表示パネル1、モールド板4、5並びにスペーサー6が接合される回路基板2、並びにこれ等両者1、2間のゼブラゴム3…は、図10に示す如き鉄板のプレス成形による枠状の裏側金属フレーム8と図11に示す如き鉄板のプレス成形による枠状の表側金属フレーム9とによって弾性挟持されている。尚図10、図11共に、（イ）は平面図、（ロ）～（ハ）は各側面図、及び（ヘ）は断面拡大図を示している。即ち、裏側金属フレーム8の周囲外壁部の弾性係止片8a…が表側金属フレーム9の周囲外壁部の舌片箇所に形成された係子穴9aに嵌合され、これに依って結合された両フレーム8、9間でゼブラゴム3…を適度に圧縮するものである。従って、液晶表示パネル1の表面の周辺箇所が表面の金属フレーム9の内面に圧着される事となるので、本実施例に於いては、該パネル1のガラス基板1aが割れるのを防止する為に、短冊状の4枚のテフロンからなるクッション材7をこれ等1、9間に介在せしめている。尚、このクッション材7も枠状に一体化して使用することも可能であるがいずれにしても各コーナーに於ける液晶表示パネル1のポイントマーク1d…箇所を除外する必要がある。これに関連して、表側金属フレーム9の各コーナーには上記液晶表示パネル1および回路基板2の各

ポイントマーク1d…、2d…が目視できるように、窓穴9c…が形成されている。

【0018】

又、これ等両金属フレーム8、9の夫々の周囲壁部にはこれ等両者8、9を最終的にねじ止め固定する為のねじ穴8b…、9b…が設けられ、さらに裏側金属フレーム8の周囲壁部には2枚重ね合わせられた状態のフレキシブルフラットリード線10、10'が共に外部に引き出されるスリット8cが形成されている。

【0019】

次に上述の如き各構成部品の組み立てについて簡単に述べる。

まず治具に固定された裏側金属フレーム8内に、スペーサー6、モールド板4、5が接合された回路基板2を配置する。この時、フレキシブルフラットリード線10、10'をスリット8cから外部へ引き出しておく。

この状態でモールド板4、5の切欠4c…、5b…から露出している端子2b、2b、2f、2fは、このモールド板4、5と裏側金属フレーム8の周囲壁部によって取り囲まれ、この位置に夫々ゼブラゴム3…を挿入する。即ち、これ等モールド板4、5と裏側金属フレーム8とがゼブラゴム位置規定材として用いられる。

【0020】

その後、4枚のゼブラゴム3…上に液晶表示パネル1の端子1e、1e、1f、1fを載置する。この時回路基板2の4コーナーのポイントマーク2a…上に液晶表示パネル1の4コーナーのポイントマーク1d…を正確に合致せしめておく。そしてこの状態で、上記クッション材7…を介して表面金属フレーム9を載置して、下方に圧着する事により、両フレーム8、9を弾性結合する。最後に、表面金属フレーム9の4コーナーの窓穴9c…から目視できる上記のポイントマーク1d…、2a…の合致を再確認できたなら、両金属フレーム8、9をねじ穴8b…、9b…を用いてねじ止め固定する。斯して、モジュール化された液晶表示装置が完成する。

【0021】

斯るモジュールは上述の如く、フレーム8、9内でゼブラゴム3…の弾性力により各板状の構成部品が圧着されているので、この各構成部品にすき間や段差があると、圧縮状態のゼブラゴム3…に圧縮歪みが生じ液晶表示パネル1と回路基板2との導通不良を招く不都合があるが、本実施例装置ではこれを解消している

。即ち、たとえフレキシブルフラットリード線が部分的に介在していても、前述した如く、スペーサー6に逃しの為の凹溝を形成する事によって、すき間や段差を解消し、ゼブラゴム3…の圧縮状態を均等なものとしている。

【0022】

【考案の効果】

回路基板の両面に駆動回路を形成することにより、回路基板の小面積化を図ると共に、液晶表示パネルの外周部が上記回路基板の少なくとも片面に形成された駆動回路と重畳する状態にまで、このパネルと基板とを重畳させることによってこの回路基板の外形寸法の縮小を図っているので、フレームの外形寸法を小さくすることができる。